

REMARKS

A. Double patenting rejection

Claims 60-73 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 32-79 of copending Application No. 09/880,204. Applicants will submit a terminal disclaimer meeting the requirements of 37 CFR 1.321(c) once all pending claims are allowed.

B. 103 Rejection relying on Seki and Anthony

Claims 60-66 are rejected under 35 U.S.C. 103(a) as obvious over Seki et al., U.S. Patent 5,553,089 (hereinafter “Seki”) in view of Anthony, “Dielectric Isolation of Silicon by Anodic Bonding,” J. Appl. Phys. 58 (3), 1 August 1985 (hereinafter “Anthony”). The Examiner states:

Seki fails to disclose the following:

- a) a transparent bonding layer disposed between said lens and a surface of said stack, said transparent bonding layer bonding said lens to said stack, said transparent bonding layer comprising an inorganic material.

However, Anthony discloses anodic bonding between glass [citation omitted]. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Seki to include anodic bonding between glass as disclosed in Anthony because it aids in providing a strong bond.

Applicants respectfully traverse the rejection for several reasons:

1. A bonding layer is not required to attach Seki’s lens

Seki’s lens is described at column 3, lines 44-55. The lens is a “transparent epoxy resin” formed by “dropping a transparent epoxy resin on the first reflecting surface 34, immersing the first reflecting surface 34 in a transparent epoxy resin, or using a mold.” Thus, Seki’s convex lens is formed of a material (epoxy) and by a process (for example, dropping) where the epoxy lens material itself adheres to the device. Further, epoxy resin is often used

as a glue and is known to provide a strong adherence. Adding an additional bonding layer to Seki would likely add additional processing steps and additional material to Seki's, increasing the cost and time required to make Seki's device. Since the addition of Anthony's bond to Seki would increase the cost of Seki's device and is not needed, there is no motivation to combine Seki with Anthony.

2. Anthony's anodic bonding subjects the device to high temperature and voltage

Further, applying Anthony's anodic bonding technique to Seki would require exposing the device and the lens to high temperature (greater than 850°C) and large voltages (greater than 30V). See, for example, the abstract of Anthony. These high temperature and high voltage conditions may damage the device and the lens. In particular, the high temperatures described by Anthony would at the very least be expected to cause Seki's organic lens material to yellow, undesirably reducing the transparency of the lens, and may cause the epoxy to vaporize. Since Seki's lens attaches without the use of a bonding technique as taught by Anthony and since the use of Anthony's technique with Seki's device may damage Seki's light emitting device or lens, Applicant can imagine no motivation to combine Seki with Anthony.

3. There is no suggestion that Anthony can be applied to other materials

Anthony teaches a method of anodically bonding together a pair of silicon wafers. There is no teaching or suggestion in Anthony that the anodic bonding technique may be applied to other materials, or to the GaAs-based device and epoxy lens of Seki. Accordingly, there is no expectation that Anthony's technique can be successfully applied to the device of Seki.

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Since there is no motivation to combine Anthony and Seki and no reasonable expectation of success, the Examiner has failed to make a *prima facie* case of obviousness for

claim 60. Applicants respectfully submit that claim 60 is allowable over Seki and Anthony. Claims 61-66 depend from claim 60 and are thus allowable for at least the same reason as claim 60.

In addition, regarding claim 61, the Examiner admits at the top of page 4 of the office action that Seki does not disclose a bonding layer at all. Accordingly, Applicants are unsure how Seki could teach a bonding layer formed from one or more of the materials listed in claim 61. Claim 61 is thus allowable for this additional reason.

Regarding claim 62, the Examiner states “Although Anthony fails to specifically disclose [a transparent bonding layer including one or more luminescent materials] . . . the same material is utilized in Anthony as in Applicant’s invention therefore it would have the same characteristics.” Again, the Examiner does not state which structure of Anthony the Examiner considers claim 60’s bonding layer; however, Anthony does not teach the inclusion of a luminescent material in any of Anthony’s structures. Further, since Anthony does not seem to teach a light emitting or any other optoelectronic device, there can be no motivation to include a luminescent material in any of Anthony’s structures. Even if Anthony did use a bonding layer of one of the materials listed in claim 61, none of these materials are luminescent materials as recited in claim 62. Claim 62 is thus allowable for this additional reason.

Regarding claim 63, the Examiner states “Anthony discloses a bonding layer that has a thickness less than 500 Angstroms (For Example: See Page 1240).” Applicants can find no mention of a bonding layer less than 500 Angstroms thick on page 1240 of Anthony. The only dimension applicants have found on this page of Anthony is in the first full paragraph of the second column, where the silicon oxide thickness is listed at 1 to 10 microns, a thickness much greater than 500 angstroms. Accordingly, even in combination, Anthony and Seki fail to teach all the elements of claim 63 and claim 63 is allowable for this additional reason.

Regarding claim 65, the Examiner states “Although Anthony fails to specifically disclose the limitations listed above, it appears that it is known that the refractive index of silicon oxide can range from 1.0-2.65 (See Bulk Measurement).” Applicants respectfully request that the Examiner provide evidence that it is known for the refractive index of silicon oxide to range from 1.0 to 2.65.

C. 103 Rejection relying on Seki and Osenbach

Claims 60-66 are rejected under 35 U.S.C. 103(a) as obvious over Seki in view of Osenbach, “Low Cost/High Volume Laser Modules Using Silicon Optical Bench Technology,” Electronic Components and Technology Conference, p. 581 (1998) (hereinafter “Osenbach”). The Examiner states:

In regards to claim 60, Seki fails to disclose the following:

- a) a transparent bonding layer disposed between said lens and a surface of said stack, said transparent bonding layer bonding said lens to said stack, said transparent bonding layer comprising an inorganic material.

However, Osenbach et al. (“Osenbach”) discloses ALO utilized as a bonding attachment for a lens [citation omitted]. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Seki to include ALO utilized as a bonding attachment as disclosed in Osenbach because it aids in providing extremely stable coupling over environmental extremes [citation omitted].

Applicants respectfully traverse the rejection for several reasons:

1. A bonding layer is not required to attach Seki’s lens

As described above in section B, Seki’s lens is described at column 3, lines 44-55.

The lens is a “transparent epoxy resin” formed by “dropping a transparent epoxy resin on the first reflecting surface 34, immersing the first reflecting surface 34 in a transparent epoxy resin, or using a mold.” Thus, Seki’s convex lens is formed of a material (epoxy) and by a process (dropping) where the epoxy lens material itself adheres to the device. Further, epoxy resin is often used as a glue and is known to provide a strong adherence. Adding an

additional bonding layer to Seki would likely add additional processing steps and additional material to Seki, increase the cost and time required to make Seki's device. Since the addition of Osenbach's AlO bond to Seki would increase the cost of Seki's device and is not needed, there is no motivation to combine Seki with Osenbach.

2. Osenbach's bond cannot be used with Seki's device

On page 582 of Osenbach, on the sixth line of the second paragraph of the second column, Osenbach states "The AlO bonding techniques provides a solid state bond between the outer surface of the lens, in this case SiO₂, and the aluminum metallization whose thickness is controlled to better than 200 nm." Emphasis added. This passage teaches AlO bonding only between an SiO₂ lens and an aluminum layer. Nowhere does Osenbach suggest or teach that other materials may be bonded using AlO bonding. The two materials in Seki that the Examiner proposes to bond using Osenbach's AlO process are a GaAs-based semiconductor device and a transparent epoxy lens, not SiO₂ and aluminum. Based on the teachings of Osenbach, a person of skill in the art would have no expectation that AlO bonding can be used on materials other than SiO₂ and aluminum. Accordingly, there is no expectation that Seki can be successfully combined with Osenbach.

3. Osenbach does not teach a transparent bonding layer

Osenbach's aluminum metallization layer with a thickness greater than 200 nm will certainly not be transparent. Accordingly, Osenbach does not teach a transparent bonding layer as recited in claim 60.

Since the combination of Seki and Osenbach does not teach a transparent bonding layer, since there is no motivation to combine Seki with Osenbach, and since there is no expectation that Seki and Osenbach can be successfully combined, the Examiner has failed to set forth any of the three requirements of a prima facie case of obviousness for claim 60.

Accordingly, claim 60 is allowable over Seki and Osenbach. Claims 61-66 depend from claim 60 and are thus allowable for at least the same reasons as claim 60.

In addition, regarding claim 61, the Examiner admits at the top of page 4 of the office action that Seki does not disclose a bonding layer at all. Accordingly, Applicants are unsure how Seki could teach a bonding layer formed from one or more of the materials listed in claim 61. Claim 61 is thus allowable for this additional reason.

Regarding claim 62, the Examiner states “Although Osenbach fails to specifically disclose [a transparent bonding layer including one or more luminescent materials] . . . the same material is utilized in Anthony [sic] as in Applicant’s invention therefore it would have the same characteristics.” Applicants can find no teaching or suggestion in Osenbach or Anthony of including a luminescent material. Even if Osenbach or Anthony did use a bonding layer of one of the materials listed in claim 61, none of these materials are luminescent materials as recited in claim 62. Claim 62 is thus allowable for this additional reason.

Regarding claim 63, Applicants can find no teaching in Osenbach of a bonding layer with a thickness less than 500 angstroms. Accordingly, even in combination, Osenbach and Seki fail to teach all the elements of claim 63 and claim 63 is allowable for this additional reason.

D. Other 103 rejections

Claims 67 and 68 are rejected under 35 U.S.C. 103(a) as obvious over Seki in view of Anthony and Sickmiller, U.S. Patent 6,214,733. Claim 71 is rejected under 35 U.S.C. 103(a) as obvious over Seki in view of Anthony and Musk, U.S. Patent 4,983,009. Claims 67, 68, and 71 depend from claim 60. Sickmiller and Musk are cited for reasons unrelated to the above-described deficiencies of Seki and Anthony with respect to claim 60. Accordingly,

claims 67, 68, and 71 are allowable over Seki, Anthony, Musk, and Sickmiller for at least the same reasons that claim 60 is allowable over Seki and Anthony.

E. Claims 69, 70, 72, and 73

The Examiner did not reject claims 69, 70, 72, or 73. These claims are listed on the Office Action Summary as objected to, though they are not mentioned in the body of the Office Action. Applicants respectfully request that the Examiner clarify the status of these claims. These claims depend from claim 60 and are thus allowable over the art discussed above for the same reason as claim 60.

Applicants respectfully request allowance of all pending claims. Should the Examiner have any questions, the Examiner is invited to call the undersigned at (408) 382-0480.

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